

What is Claimed is:

1. An intraoral electromuscular stimulation device adapted to provide intraoral electrical stimulation to a patient, said device comprising:

a first electrode;

a first support member adapted to support said first electrode in a sublingual location posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar of a patient;

a second electrode; and

a second support member adapted to support said second electrode in a sublingual position posterior relative to said first electrode.

2. An intraoral electromuscular stimulation device according to claim 1, wherein said first support member and said second support are fixed to one another to define a dental appliance.

3. An intraoral electromuscular stimulation device according to claim 2, further comprising at least one attachment member operatively connected to said dental appliance, said attachment member being adapted and arranged to secure said dental appliance to an anatomical structure within a patient's oral cavity.

4. An intraoral electromuscular stimulation device according to claim 2, wherein said dental appliance includes a passageway adapted to communicate an airway of a patient with a pressure support system for providing a breathing gas to a patient at an elevated pressure.

5. An intraoral electromuscular stimulation device according to claim 1, further comprising:

a third electrode;

a third support member adapted to support said third electrode in a sublingual position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar located on a side of a patient's oral cavity opposite said first electrode;

a fourth electrode; and

a fourth support member adapted to support said fourth electrode in a sublingual position posterior relative to said third electrode.

6. An intraoral electromuscular stimulation device according to claim 5, wherein said first support member, said second support member, said third support member and said fourth support member are fixed to one another to define a dental appliance.

7. An intraoral electromuscular stimulation device according to claim 1,
further comprising:

a third electrode; and

a third support member adapted to support said third electrode in a
sublingual position posterior relative to said second electrode.

8. An intraoral electromuscular stimulation device adapted to provide
intraoral electrical stimulation to a patient, said device comprising:

a first electrode;

a second electrode; and

supporting means for supporting said first electrode and said second
electrode such that said first electrode is sublingually supported at a position posterior to
a frenulum and generally proximate to one of a first molar, a second molar and a third
molar of a patient and said second electrode is sublingually supported in a position
posterior relative to said first electrode.

9. An intraoral electromuscular stimulation device according to claim 8,
wherein said supporting means is a unitary dental appliance on which said first electrode
and said second electrode are disposed.

10. An intraoral electromuscular stimulation device according to claim 9,
wherein said dental appliance includes a passageway adapted to communicate an airway

of a patient with a pressure support system for providing a breathing gas to a patient at an elevated pressure.

11. An intraoral electromuscular stimulation device according to claim 8, further comprising attaching means for securing said supporting means to an anatomical structure within a patient's oral cavity.

12. An intraoral electromuscular stimulation device according to claim 8, further comprising:

a third electrode, wherein said supporting means supports said third electrode in a sublingual position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar on a side of an oral cavity opposite said first electrode; and

a fourth electrode, wherein said supporting means supports said fourth electrode in a sublingual position posterior relative to said third electrode.

13. An intraoral electromuscular stimulation device according to claim 8, further comprising a third electrode, wherein said supporting means also supports said third electrode such that said third electrode is sublingually supported at a position posterior to said second electrode.

14. An electromuscular stimulating system comprising;

(1) an intraoral electrode dental appliance, comprising:

a first electrode,

a first support member adapted to support said first electrode in a sublingual position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar of a patient,

a second electrode, and

a second support member adapted to support said second electrode in a sublingual position posterior relative to said first electrode; and

(2) a stimulation unit operatively coupled to said first electrode and said second electrode, said stimulation unit providing stimulating energy to a portion of a patient via said first and said second electrodes such that stimulation of said portion of said patient takes place in one of an anterior-to-posterior direction and a posterior-to-anterior direction.

15. An electromuscular stimulating system according to claim 14, wherein

said stimulation unit includes:

a power supply; and

a control unit operatively coupled to said power supply to provide stimulating energy to said first and said second electrodes as a series of pulses and to control at least one characteristic of said series of pulses.

16. An electromuscular stimulating system according to claim 14, wherein said stimulation unit further includes a sensor adapted to detect a physiological characteristic of a patient and to provide a signal to said stimulation unit indicative of said physiological condition, and wherein said stimulation unit controls said series of pulses based on said signal from said sensor.

17. An electromuscular stimulating system according to claim 14, further comprising:

a third electrode;

a third support member adapted to support said third electrode in a sublingual position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar located on a side of a patient's oral cavity opposite said first electrode;

a fourth electrode; and

a fourth support member adapted to support said fourth electrode in a sublingual position posterior relative to said third electrode, wherein said a stimulation unit is operatively coupled to said third electrode and said fourth electrode and provides stimulating energy to a patient via said third and said fourth electrodes such that stimulation of said patient takes place in one of an anterior-to-posterior direction and a posterior-to-anterior direction.

18. An electromuscular stimulating system according to claim 14, further comprising:

a third electrode; and

a third support member adapted to support said third electrode in a sublingual position posterior relative to said second electrode.

19. An electromuscular stimulating system according to claim 14, wherein said first support member and said second support are fixed to one another to define a dental appliance and wherein said dental appliance includes a passageway adapted to communicate an airway of a patient with a pressure support system for providing a breathing gas to a patient at an elevated pressure.

20. An electromuscular stimulating system according to claim 14, further comprising a pressure support system providing a gas flow to a patient, said pressure support system comprising:

a pressure generator,

a conduit operatively coupled to said pressure generator, and

a patient interface device operatively coupled to said conduit for communicating said conduit with an airway of a patient.

21. An electromuscular stimulating system comprising:

(1) an intraoral electrode dental appliance, comprising:

a first electrode,
a second electrode, and
supporting means for supporting said first electrode and said second electrode such that said first electrode is sublingually supported in a position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar in a patient and said second electrode is sublingually supported in a position posterior relative to said first electrode; and

(2) stimulating means for providing stimulating energy to a portion of a patient through said first and said second electrodes such that stimulation of said portion of said patient takes place in one of an anterior-to-posterior direction and a posterior-to-anterior direction.

22. An electromuscular stimulating system according to claim 21, further comprising:

a third electrode, wherein said supporting means supports said third electrode in a sublingual position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar on a side of a patient's oral cavity opposite said first electrode; and

a fourth electrode, wherein said supporting means supports said fourth electrode in a sublingual position posterior relative to said third electrode.

23. An electromuscular stimulating system according to claim 21, further comprising sensing means for detecting a physiological characteristic of a patient and for providing a signal to said stimulating means indicative of said physiological condition, said stimulating means controlling impulses provided to said patient based on said signal from said sensing means.

24. A method of providing intraoral eletromuscular simulation comprising:

positioning a first electrode in a patient's oral cavity such that said first electrode is sublingually supported in a position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar;

positioning a second electrode in a patient's oral cavity such that said second electrode is sublingually supported in a position posterior relative to said first electrode;

applying an electrical stimulation to a portion of a patient between said first electrode and said second electrode.

25. A method according to claim 24, further comprising:

detecting a physiological characteristic of a patient; and

providing a signal indicative of said physiological condition, wherein said applying electrical stimulation step includes controlling electrical pulses provided to a patient based on said signal indicative of said physiological condition.

26. A method according to claim 24, further comprising:

positioning a third electrode in a patient's mouth such that said third electrode is sublingually supported in a position posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar on a side of a patient's oral cavity opposite said first electrode;

positioning a fourth electrode in a patient's oral cavity such that said fourth electrode is sublingually supported in a position posterior relative to said third electrode;

applying an electrical stimulation to a portion of a patient between said third electrode and said fourth electrode.

27. A method according to claim 24, wherein positioning said first electrode and said second electrode includes sublingually locating a dental appliance on which said first electrode and said second electrode are disposed and securing said dental appliance to an anatomical structure within a patient's mouth.

28. A method according to claim 24, further comprising a step of providing a flow of gas to a patient via a patient interface device.

29. An intraoral electromuscular stimulation device adapted to provide intraoral electrical stimulation to a patient, said device comprising:

a first electrode;

a first support member adapted to support said first electrode in a sublingual location within a patient on a first side of a patient's oral cavity relative to a patient's midline;

a second electrode;

a second support member adapted to support said second electrode in a sublingual location within a patient posterior relative to said first electrode and on a same side of a patient's oral cavity with respect to a patient's midline;

a sensor adapted to detect a respiratory parameter of a patient and to output a signal indicative thereof; and

a control unit operatively coupled to said sensor, said first electrode and said second electrode, said control unit receiving said signal from said sensor and distinguishing between inspiration and expiration of a patient based thereon, said control unit initiating an electrical stimulation of a patient in one of an anterior-to-posterior and posterior-to-anterior direction via said first and said second electrodes at a stimulation start time prior to onset of inspiration, continuing stimulation through a portion of inspiration, and providing stimulation at an energy level sufficient to induce contraction of a targeted muscle without inducing pain.

30. An intraoral electromuscular stimulation device according to claim 29, wherein said stimulation start time is between 100-200 ms prior to onset of inspiration

31. An intraoral electromuscular stimulation device according to claim 29, wherein said control unit determines a start time for initiating stimulation by comparing said signal to a threshold value.

32. An intraoral electromuscular stimulation device according to claim 29, wherein said sensor is one of a respiratory effort detector and a device adapted to measure a flow of fluid.

33. An intraoral electromuscular stimulation device according to claim 29, wherein said first support member is adapted to support said first electrode in a sublingual location posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar of a patient, and wherein said second support member is adapted to support said second electrode in a sublingual position posterior relative to said first electrode.

34. An intraoral electrode stimulation device according to claim 33, wherein said first support member and said second support are fixed to one another to define a dental appliance.

35. An intraoral electrode stimulation device according to claim 33, further comprising:

a third electrode; and

a third support member adapted to support said third electrode in a sublingual position posterior relative to said second electrode.

36. An intraoral electrode stimulation device according to claim 29, further comprising:

a third electrode;

a third support member adapted to support said third electrode in a sublingual position on a side of a patient's oral cavity opposite a side associated with said first electrode;

a fourth electrode; and

a fourth support member adapted to support said fourth electrode in a sublingual position on said side of a patient's oral cavity opposite said side associated with said first electrode posterior to said third electrode.

37. An intraoral electrode stimulation device according to claim 36, wherein said first support member is adapted to support said first electrode in a sublingual location posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar of a patient, wherein said second support member is adapted to support said second electrode in a sublingual position posterior relative to said first electrode, wherein said third support member is adapted to support said third electrode in a sublingual location posterior to a frenulum and generally proximate to one of a first molar, a second molar and a third molar on a side of an oral cavity opposite said first

electrode, wherein said fourth support member is adapted to support said fourth electrode in a sublingual position posterior relative to said third electrode, and wherein said control unit provides stimulating energy to a portion of a patient via said third and said fourth electrodes such that stimulation of said portion of said patient takes place in one of an anterior-to-posterior direction and a posterior-to-anterior direction.

38. A method of providing intraoral electromuscular simulation comprising:

- positioning a first electrode and a second electrode in sublingual positions within a patient's oral cavity on a same side of patient's oral cavity relative to a patient's midline, wherein said second electrode is located in a position posterior relative to said first electrode;
- detecting a respiratory parameter of a patient and providing a signal indicative thereof, said parameter being sufficient to differentiate between inspiration and expiration of a patient; and
- applying an electrical stimulation to a portion of a patient between said first electrode and said second electrode in one of a posterior-to-anterior direction and an anterior-to-posterior direction, wherein initiating application of said electrical stimulation occurs at a stimulation start time prior to onset of inspiration and continues through a portion of inspiration, and wherein stimulation is provided at an energy level sufficient to induce contraction of a targeted muscle without inducing pain.

39. A method according to claim 38, wherein said stimulation start time is between 100-200 ms prior to onset of inspiration

40. A method according to claim 38, wherein said step of applying electrical stimulation includes determining a start time for initiating stimulation by comparing said signal to a threshold value.

41. A method according to claim 38, wherein said respiratory parameter is one of a respiratory effort and a flow of fluid.

42. A method according to claim 38, wherein positioning said first electrode and said second electrode includes locating a dental appliance on which said first electrode and said second electrode are disposed within an oral cavity of a patient and securing said dental appliance to an anatomical structure within a patient's mouth.